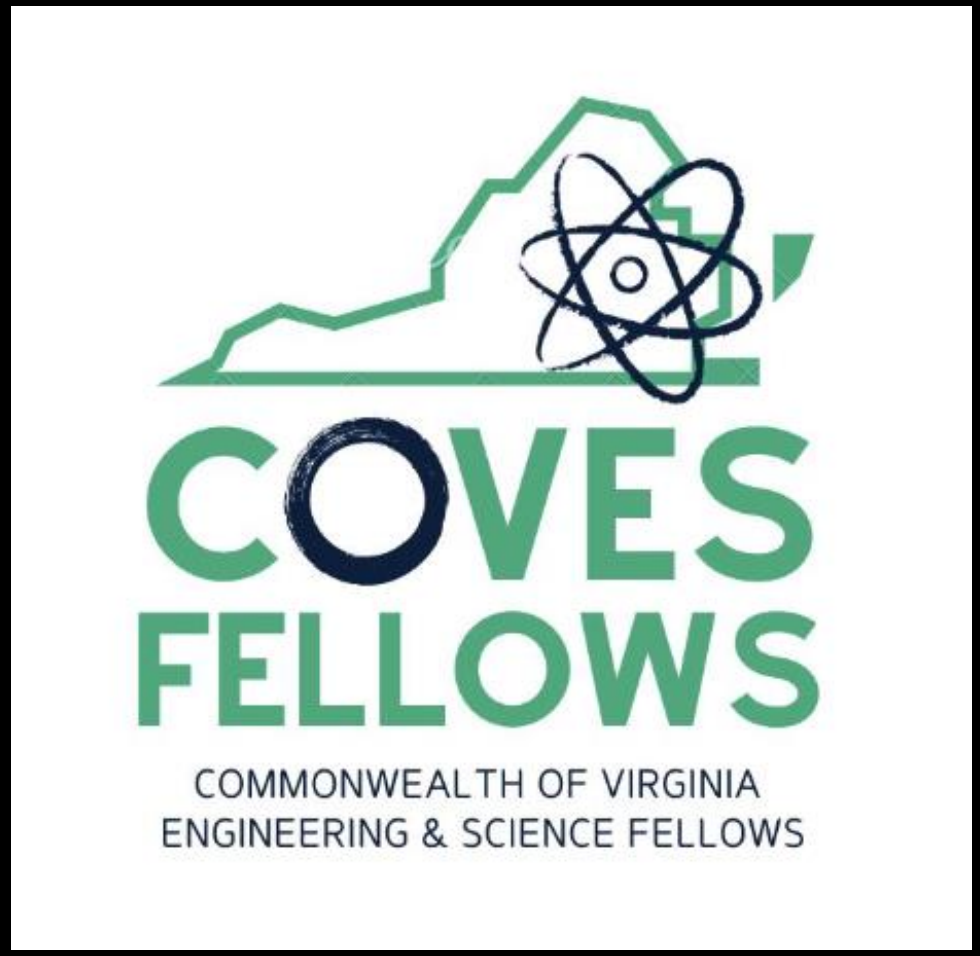

Hosted by the
Virginia Academy of Science, Engineering & Medicine

Tara Illgner

UVA Graduate Student studying:

Atmospheric Chemistry and Science Policy

- **Seeking Carbon Capture and Sequestration options for urgent implementation**

Summer Experience with JCOTS

- **VCDPA Working Group Meetings**
- **VASEM Coastal Flooding Report**
- **Child Protection Online**
- ***Carbon Capture Options for VA***

Meeting the Goals of the Virginia Clean Economy Act Using Carbon Capture

Prepared by Tara Illgner

COVES 2021 Fellow for JCOTS

Presented September 13, 2021

Introduction

- VCEA goal is 100% carbon-free electricity generation by 2045
- Carbon Capture and Sequestration (CCS) is pivotal to this goal
- In Feb, 2020: SB1374 established a Carbon Sequestration Task Force
  - Focuses exclusively on Natural Options, which are very important
- Issue Brief discusses Natural and Technological CCS options

Background

- Climate change is being caused by the emission of carbon dioxide (CO_2) from burning fossil fuels
- CO_2 and other Greenhouse Gases form a heat-trapping layer like a car windshield on a sunny day
- Before fossil-fuel burning became the norm, the atmospheric CO_2 concentration was 270 ppm
- Now CO_2 concentrations are over 400 ppm, and on track to increase quickly

Solutions to Reduce CO_2 Emissions:

- **Energy Efficiency, for *reduced* CO_2 emissions**
  - Appliances, light bulbs
- **Renewable Energy, for *zero* CO_2 emissions**
  - Wind, Solar
- **Carbon Capture, for *reduced* or *zero* emissions**

Carbon Capture Options

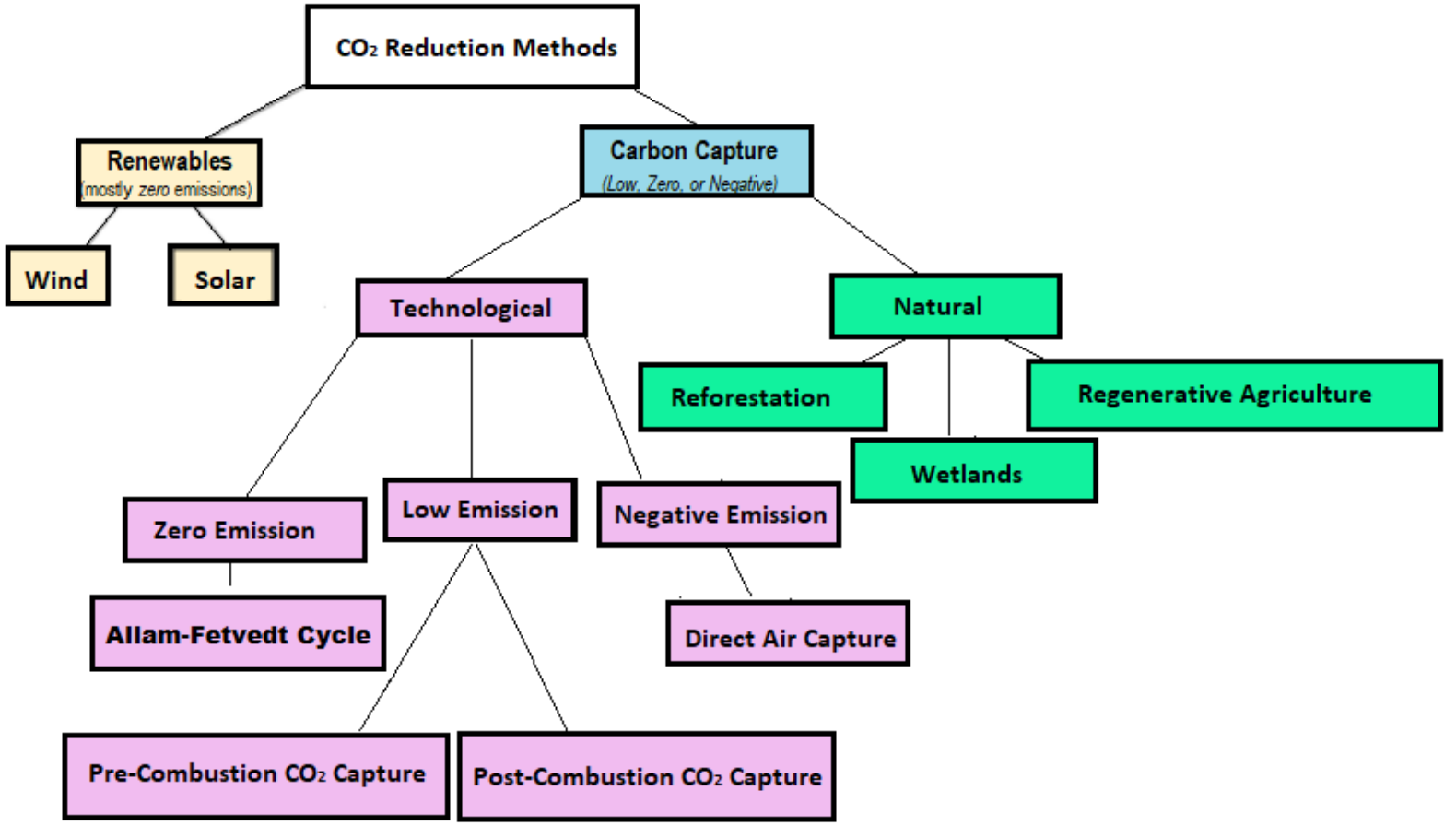

Chart displays two distinct categories of CO_2 reduction solutions: renewables and carbon capture. Each category is further broken down into various methods and technologies.

Carbon Capture Tech in Virginia

- Case (PUE-2007-00068) brought before the SCC in 2007
- Appalachian Power Company sought a rate adjustment
- To accommodate a planned Pre-Combustion power facility in WV
- This was the only known case of CCS Technology attempted in VA

Carbon Capture in Other States

- Data is sparse
- The Global CCS (GCCS) Institute is the only known reliable source
- The GCCS 2020 report shows strong growth of CCS facilities around the globe
- As of 2021 there are 65 CCS facilities worldwide at various stages of development – 26 are operational
- 38 of those are in the US

Cost Comparison

Carbon Capture	Methods	Cost
Technological	Pre-combustion carbon capture	6.1 cents/kWh
	Post-combustion carbon capture	6.2 cents/ kWh
	Allam-Fetvedt Cycle	1.9 cents/ kWh

Di Lorenzo, Giuseppina. "*Pre-combustion carbon-capture technologies for power generation: an engineering-economic assessment*." *International Journal of Energy Research*. March 11, 2013. Wiley Online Library, p. 1.

"*Improvement in Power Generation with Post-Combustion Capture of CO2.*" ieaghg.org, p. 4.

Conca, James. "*Net Zero Natural Gas Plant -- The Game Changer*." July 31, 2019. Forbes.com.

Conclusion

- I recommend that all CCS options be explored to meet the goals set by the VCEA of 100% carbon-free electric generation by 2045
- Recent new technologies, like DAC and the Allam-Fetvedt Cycle can accelerate achieving Virginia's carbon-reduction goals
- Carbon Capture technologies capture CO_2 from industrial processes rather than emitting it to the atmosphere
- This captured CO_2 can then be reused for power generation as a renewable resource or sold as a usable commodity to other industries – a potential win-win

Thank you

- Grateful to members of JCOTS for your time today
- Grateful to Del. Hayes, David Barry, Hassan Abdelhalim, Lisa Wallmeyer, VASEM, UVA and others for supporting the COVES Fellowship
- Please feel free to contact me at **tl9f@virginia.edu**